

DATE: January 23, 2004

TO: Region Engineers
Region Delivery Engineers
TSC Managers
Resident/Project Engineers
Region Construction Engineers

FROM: Larry E. Tibbits
Chief Operations Officer

John C. Friend
Engineer of Delivery

SUBJECT: Bureau of Highway Instructional Memorandum 2004-06
Open Graded Base Course, Modified and Aggregate Base Under HMA

Over the past four years several special provisions have been included in projects to modify the gradation of 21AA aggregate base under hot mix asphalt (HMA) pavement to provide a more drainable base than the standard 21AA material. During this same period, the Division 3 Spec Book Committee worked with industry to revise the 1996 standard specifications for open-graded materials typically used under concrete pavements to provide more support. The resulting open-graded 4G material included in the 2003 standard specifications meets the requirements for both stability under flexible pavements and drainability under rigid pavements.

Recognizing the potential for material breakdown during transport and placement, a team of Construction and Technology (C&T) and region materials staff developed in-place acceptance and pay adjustment criteria for 4G material, regardless of the pavement surface type. To ensure the effectiveness of the pay adjustment criteria and allow the contractor to establish the contract unit price accordingly, the department will set the base price for aggregate base and open-graded drainage course pay items in the contract proposal by way of companion base price special provisions. At this time, the engineer's estimate will be used as the base price.

C&T has approved the attached special provisions and is asking that these provisions be used statewide for this type of work in order to reduce the number of project-specific modifications to the standard specification. C&T and the regions will monitor the use and performance of these specifications over the course of the next construction season to determine if they are providing the anticipated materials quality control results. Further evaluation of pavement performance will ultimately determine the effectiveness of the aggregate gradation in providing an improved pavement structure.

The frequently used special provision 03SP303(A), Special Provision for Open-Graded Drainage Course, Modified and its companion Special Provision for Open Graded Drainage Course Base Prices, must be used on all projects that include open graded drainage course pay items. This

new version of 03SP303(A) has been submitted to the Specs and Estimates Unit to be added to the Design SS/SP system. The template document for the base price special provision has been posted to the C&T web page as a previously approved special provision and requires only the insertion of the pay item and base price.

The project specific Special Provision for Aggregate Base Under HMA Pavement and its companion Special Provision for Aggregate Base Under HMA Pavement Base Prices is intended for use whenever a drainable base is required under flexible pavement. These two special provisions have also been posted to the C&T web page. Project managers are asked to discontinue the use of region-specific special provisions generally titled Aggregate Base, Modified or Aggregate 21AA, Modified that have been used in the past to achieve the same results. C&T will work with project managers on a case-by-case basis if the Special Provision for Aggregate Base Under HMA Pavement requires modification to include replacing not only base material, but also subbase material with the 4G aggregate.

Contact Al Robords 517-322-1357 or Curtis Bleech 517-322-1237 with any questions regarding the use of these special provisions.

Chief Operations Officer

Engineer of Delivery

BOHD:C/T:JAR:kab

Index: Materials
Attachments

cc: C & T Support Area Staff
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MICHIGAN
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION

FOR
OPEN-GRADED DRAINAGE COURSE, MODIFIED

C&T:ACR

1 of 3

C&T:APPR:JAR:CB:12-09-03
FHWA:APPR:12-10-03

a. Description. Furnish and place an unbound, open-graded aggregate on an approved surface according to the details shown on the plans and section 303 of the Standard Specifications for Construction except as modified by this special provision.

b. Materials. Use materials meeting the following.

Open-Graded Aggregate 4G902

When specified on the plans, and provided that all restrictions stated in subsection 902.06 are met, 4G aggregate for use as open-graded aggregate on this project may be produced from crushed concrete. The aggregate gradation at the time of shipment from the source of production must meet the gradation requirements for 4G in Table 902-1 of the standard specifications. The gradation requirements after placement and compaction are as shown in Table 1 of this special provision.

Make allowance for and be solely responsible for degradation and segregation during shipment and placement of the open-graded material.

Acceptance of the open graded aggregate may be based on samples obtained anytime prior to paving. Prior to placement, Michigan Test Method (MTM) 107 will be followed to obtain the samples. After compaction, sample locations will be determined according to MTM 119 except that when layer thickness greater than 4 inches is specified, mechanical methods may be used to assist in obtaining each sample increment.

c. Construction. Construct open-graded drainage course (OGDC), modified according to section 303 of the standard specifications with the following modifications.

1. **Placement and Compaction** - Place and compact a control strip as specified in section (c.2.A) of this special provision to establish a placement and rolling pattern which will achieve at least 95 percent compaction. If a thickness greater than 8 inches is specified, place the OGDC in two approximately equal lifts. Compact each layer to not less than 95 percent of its maximum unit weight.

Any observed segregation, degradation, rutting, or contamination will be investigated by the Engineer and corrective action may be required.

Finish the surface of the OGDC as specified in subsection 303.03.B of the standard specifications.

2. Testing and Acceptance -

- A. **Control Strip** - Construct control strip according to subsection 303.03.E.1. Do not place OGDC beyond the limits of the control strip until an acceptable placement method is determined and verified by test results.

An in-place gradation sample will be obtained from the control strip prior to the start of placement operations. When required, drainability will be estimated using either MTM 122 or ASTM D 2434.

Notify the Engineer whenever placement procedures are modified or the production gradation of the 4G aggregate changes by more than 5 percent on any sieve or the loss by wash changes by more than 1.0 percent. Another 600-foot control strip may be requested, established, and tested.

- B. **In-place Acceptance Criteria** - The Engineer may sample and test the in-place OGDC for final acceptance. If segregation, degradation, or contamination is suspected, the Engineer will provide written notification of the need for in-place testing and determine the limits of the area subject to in-place acceptance.

Stop OGDC placement upon receipt of this notification of the need for in-place testing. Stop paving operations when the area subject to in-place acceptance is reached. Resume OGDC placement and paving operations only with the Engineer's approval.

All OGDC material placed or paved over after receipt of notification of the need for in-place testing may be deemed to be unauthorized work as specified by subsection 104.05 of the standard specifications.

The Engineer will collect a sample from the defined area and from the area behind and ahead of the defined area for verification of the limits of the area subject to in-place acceptance. All in-place acceptance testing will be completed within 48 hours of the time the sample is removed from the project.

The in-place aggregate gradation for any test area, including control strips, must be within the limits shown in Table 1. Areas outside these gradation limits will be subject to the pay adjustment or remove and replace requirements described in section (e) of this special provision.

**Table 1: Sieve and LBW Gradation Limits
for In-Place Material**

Sieve	Gradation Limits, percent passing
1 1/2 inch	<100
3/4 inch	55 - 85
1/2 inch	35 - 70
#8	10 - 35
# 30	5 -23
Loss by Wash	8.0 max

d. Measurement and Payment. The completed work as described will be measured according to subsection 303.04 of the standard specifications and will be paid for using the following contract items as indicated in the contract documents. These contract items are subject to the pay adjustments described in this special provision.

Contract Item (Pay Item)**Pay Unit**

Open-Graded Dr Cse, ___ inch, Modified Square Yard
 Open-Graded Dr Cse, CIP, Modified.....Cubic Yard

All costs associated with constructing control strips and for corrective action, including corrections due to seasonal shut down, necessary to rectify degradation and segregation are included in the associated item of work.

e. Pay Adjustment Computation. Pay adjustments are not cumulative; only the largest of the computed pay adjustments will be applied. All pay adjustments are negative. Pay adjustment are computed using the following formula:

$$\text{Pay Adjustment} = \text{Pay Factor} \times (\text{quantity}) \times (\text{base price})$$

Where:

Pay factor = Value shown in Table 2 or 3 as applicable
 (expressed as a decimal percent)
 Quantity = Quantity subject to adjustment
 Base Price = Unit price established by the Department and shown in the
 Special Provision for Open-Graded Drainage Course,
 Modified Base Prices included in the contract documents

**Table 2: Pay Factor for
Exceeding Gradation Limits on Any Sieve**

Amount Exceeding Gradation Limit	Pay Factor, %
<0.1	0
0.1 - 3.0	10
3.1 - 5.9	30
= 6.0	50 or remove and replace

**Table 3: Pay Factor for
Exceeding Loss By Wash Limits**

Amount Exceeding Gradation Limit	Pay Factor, %
<0.1	10
0.1 - 1.0	50
> 1.0	90 or remove and replace

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
OPEN-GRADED DRAINAGE COURSE, MODIFIED BASE PRICES

1 of 1

a. Description. This special provision lists the base price(s) for open graded drainage course item(s) for use in conjunction with the Special Provision for Open Graded Drainage Course, Modified included in the contract documents.

b. Base Prices. The base price(s) shown below will be used in determining the pay adjustments for the pay item(s) listed:

Pay Item Code	Pay Item Name	Unit	Base Price
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**DESIGNER MUST INCLUDE THE OGDC RELATED PAY ITEM(S) AND
THE ENGINEER'S ESTIMATE.**

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
AGGREGATE BASE UNDER HMA PAVEMENT

C&T:ACR

1 of 3

C&T:APPR:JAR:CB:12-09-03

a. Description. Furnish and place an unbound, aggregate base course on an approved surface according to the details shown on the plans and section 302 of the Standard Specifications for Construction except as modified by this special provision.

b. Materials. Use materials meeting the following.

Open-Graded Aggregate 4G902

When specified on the plans, and provided that all restrictions stated in subsection 902.06 are met, 4G aggregate for use as aggregate base on this project may be produced from crushed concrete. The aggregate gradation at the time of shipment from the source of production must meet the gradation requirements for 4G in Table 902-1 of the standard specifications. The gradation requirements after placement and compaction are as shown in Table 1 of this special provision.

Make allowance for and be solely responsible for degradation and segregation during shipment and placement of the aggregate base material.

Acceptance of the aggregate base may be based on samples obtained anytime prior to paving. Prior to placement, Michigan Test Method (MTM) 107 will be followed to obtain the samples. After compaction, sample locations will be determined according to MTM 119, except that when layer thickness greater than 4 inches is specified, mechanical methods may be used to assist in obtaining each sample increment.

c. Construction. Construct aggregate base course according to section 302 of the standard specifications with the following modifications.

1. **Placement and Compaction** - Place and compact a control strip as specified in section (c.2.A) of this special provision to establish a placement and rolling pattern which will achieve at least 95 percent compaction. If a thickness greater than 8 inches is specified, place the aggregate base in two approximately equal lifts. Compact each layer to not less than 95 percent of its maximum unit weight.

Any observed segregation, degradation, rutting, or contamination will be investigated by the Engineer and corrective action may be required.

Finish the surface of the aggregate base course as specified in subsection 302.03.A of the standard specifications.

2. Testing and Acceptance -

- A. **Control Strip** - Construct control strip in the same manner as specified for OGDC in subsection 303.03.E.1. Do not place aggregate base beyond the limits of the control strip until an acceptable placement method is determined and verified by test results.

An in-place gradation sample will be obtained from the control strip prior to the start of placement operations. When required, drainability will be estimated using either MTM 122 or ASTM D 2434.

Notify the Engineer whenever placement procedures are modified or the production gradation of the 4G aggregate changes by more than 5 percent on any sieve or the loss by wash changes by more than 1.0 percent. Another 600-foot control strip may be requested, established, and tested.

- B. **In-place Acceptance Criteria** - The Engineer may sample and test the in-place aggregate base material for final acceptance. If segregation, degradation, or contamination is suspected, the Engineer will provide written notification of the need for in-place testing and determine the limits of the area subject to in-place acceptance.

Stop aggregate base placement upon receipt of this notification of the need for in-place testing. Stop paving operations when the area subject to in-place acceptance is reached. Resume aggregate base placement and paving operations only with the Engineer's approval.

All OGDC material placed or paved over after receipt of notification of the need for in-place testing may be deemed to be unauthorized work as specified by subsection 104.05 of the standard specifications.

The Engineer will collect a sample from the defined area and from the area behind and ahead of the defined area for verification of the limits of the area subject to in-place acceptance. All in-place acceptance testing will be completed within 48 hours of the time the sample is removed from the project.

The in-place aggregate gradation for any test area, including control strips, must be within the limits shown in Table 1. Areas outside these gradation limits will be subject to the pay adjustment or remove and replace requirement discussed in section (e) of this special provision.

**Table 1: Sieve and LBW Gradation Limits
for In-Place Material**

Sieve	Gradation Limits, percent passing
1 1/2 inch	<100
3/4 inch	55 - 85
1/2 inch	35 - 70
#8	10 - 35
# 30	5 -23
Loss by Wash	8.0 max

d. Measurement and Payment. The completed work as described will be measured according to subsection 302.04 of the standard specifications and will be paid for using the following contract items. These contract items are subject to the pay adjustments described in this special provision.

Contract Item (Pay Item)**Pay Unit**

Aggregate Base, ___ inch, Modified..... Square Yard

All costs associated with constructing control strips and for corrective action, including corrections due to seasonal shut down, necessary to rectify degradation and segregation are included in the associated item of work.

e. Pay Adjustment Computation. Pay adjustments are not cumulative; only the largest of the computed pay adjustments will be applied. All pay adjustments are negative. Pay adjustment are computed using the following formula:

$$\text{Pay Adjustment} = \text{Pay Factor} \times (\text{quantity}) \times (\text{base price})$$

Where:

Pay factor = Value shown in Table 2 or 3 as applicable
(expressed as a decimal percent)

Quantity = Quantity subject to adjustment

Base Price = Unit price established by the Department and shown in the
Special Provision for Aggregate Base Under HMA
Pavement Base Prices included in the contract documents.

**Table 2: Pay Factor for
Exceeding Gradation Limits on Any Sieve**

Amount Exceeding Gradation Limit	Pay Factor, %
<0.1	0
0.1 - 3.0	10
3.1 - 5.9	30
= 6.0	50 or remove and replace

**Table 3: Pay Factor for
Exceeding Loss By Wash Limits**

Amount Exceeding Gradation Limit	Pay Factor, %
<0.1	10
0.1 - 1.0	50
> 1.0	90 or remove and replace

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
AGGREGATE BASE UNDER HMA PAVEMENT BASE PRICES

1 of 1

a. Description. This special provision lists the base price(s) for Aggregate Base, ____ inch, Modified item(s) for use in conjunction with the Special Provision for Aggregate Base Under HMA Pavement included in the contract documents.

b. Base Prices. The base price(s) shown below will be used in determining the pay adjustments for the pay items(s) listed:

Pay Item Code	Pay Item Name	Unit	Base Price
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DESIGNER MUST INCLUDE THE AGG BASE RELATED PAY ITEM(S)
AND THE ENGINEER'S ESTIMATE.